Wisconsin Geological
and Natural History Survey

I. C. 6275

MAY, 1930

DEPARTMENT OF COMMERCE

UNITED STATES BUREAU OF MINES
SCOTT TURNER, DIRECTOR

INFORMATION CIRCULAR

MINE SAFETY AND ACCIDENT ECONOMY IN COLORADO METAL MINES

BY

E. H. DENNY

Digitized by Google

I.C.6275.
May, 1390.

INFORMATION CIRCULAR

DEPARTMENT OF COMMERCE - BUREAU OF MINES

MINE SAFETY AND ACCIDENT ECONOMY IN COLORADO METAL MINES[1]

By E. H. Denny[2]

In discussing safety in Colorado metal mines there are two important points for metal-mining men to consider, namely, the direct and indirect cost of accidents and the possibility and means of preventing accidents.

For statistics on Colorado metal-mine accidents, reference has been made to published reports of the United States Bureau of Mines on metal-mine accidents from 1919 to 1927. This period was considered because only with the year 1919 are complete figures on nonfatal accidents available and because these years represent postwar activities; 1927 is the last year for which the U. S. Bureau of Mines has published accident statistics.

During the nine-year period 1919 to 1927, inclusive, 153 metal miners were killed by mine accidents in Colorado and 5,035 miners suffered lost-time injuries. The accident-frequency rate of number killed per 1,000 300-day workers for this nine-year period was 4.68 as compared with the general average of 3.26 for all the metal mines of the United States for the same period. In other words, the fatality rate in the metal mines of Colorado for this nine-year period averaged 40 per cent higher than that of the metal-mining industry in the United States generally. In 1924 and 1926 the Colorado metal mines had a better accident record than the average of those of the United States, but 1927 was a bad accident year and the State Bureau of Mines figures for 1928 and 1929 showing respectively 18 and 23 men killed in and about the metal mines indicate a continuing relatively high death rate from accident.

The cost of accidents to the miner for the period 1919 to 1927 can be estimated from the accident figures just given. The United States Bureau of Mines as well as other authorities assess 6,000 days lost time for every fatality and every permanent total disability. These authorities have also agreed that a permanent partial disability costs 800 days lost time to the worker over his working lifetime, that lost time injuries of less than 14 days average about 6 days lost time and lost time injuries not involving permanent disability but having loss of more than 14 days average 32 days lost time. On this basis the Colorado metal miners have suffered in nine years a gross loss of 1,214,146 days, or, at $5 per day, $6,070,730. The miner receives about one-ninth of this amount in compensation so that the net loss to the metal miner in Colorado for this nine-year period was about $5,400,000.

---

1 - The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6275 "

2 - District engineer, U. S. Bureau of Mines field office, Denver, Colo.

Digitized by Google

The net cost to the mine operator from metal mine accidents is believed to be at least as great as to the miner or over $5,000,000 for this period, although costs are less easy to figure. The National Safety Council considers as a result of its studies in industry generally that the cost to the employer from accidents is about the same as that to the employee. In reckoning accident cost to the metal-mine employer there has to be considered not only the compensation paid to the employee (handled mainly in Colorado by insurance with the State, administered by the Industrial Commission of Colorado under the Workmen's Compensation Act) but also costs of interruption of production due to accident, cost of replacement of injured workers, cost of damage or destruction of property, cost of reduced morale and efficiency of employees due to accident, cost of medical and hospital care, cost of court fees and probably of other items. The cost of accidents to employer and employee of Colorado metal mines between 1919 and 1927 is estimated as approximately $10,800,000 or $1,200,000 a year.

The State metal-mining accident experience has been discussed with State officials administering the Colorado Workmen's Compensation Act and it appears that on a basis of a rate of about $4.27 per $100 of pay roll the State metal-mining accident experience has been such that during the past six months an insurance dividend of 25 per cent was possible. However the accident fatality rate of Colorado metal mines is high compared with the United States average and the cost to operator and miner is a large sum even in comparison with the value of the mineral output of the State. Lessening of accidents should materially decrease the insurance rate.

Having thus discussed the cost of accidents it appears logical to consider the feasibility of accident reduction in metal mining and how such reduction may be accomplished.

Accidents have been reduced by some metal-mining companies both large and small, and the fatal-accident rate in the metal mines of the United States has shown a definite decrease since 1911.

The following are a few instances of good accident records made by metal-mining companies:

The Berkshire Iron mine at Stambaugh, Mich., worked 50,436 man-shifts in 1928 employing over 100 men, and had no lost time accidents. In 1927 it had only three lost-time accidents.

The Lucky Bill mine of the Federal Mining and Smelting Co. of Cardin, Okla., operated without a fatality during 1926, 1927, and 1928 and with but four lost-time accidents. The mine worked 47,337 man-shifts.

The Morris-Lloyd mine of the Cleveland-Cliffs Iron Co. near Ishpeming, Mich., recently worked well over a year without any lost-time injuries, and there were nearly 68,000 working shifts involved.

The Phelps Dodge Corporation as a result of a safety organization formed in 1925

Digitized by Google

cut its accident rate in its metal branches by the close of 1927 to 89 per cent below their 1924 figures. About 2,386 lost-time accidents in 2,278,596 shifts worked in 1924 were cut to 263 lost-time accidents in 2,150,000 shifts worked in 1927 - a reduction of 2,123 accidents.

Other industries are showing remarkable records in accident reduction. The cement industry in a six-year period has decreased accident frequency 29 per cent, accident severity 30 per cent, and has increased production 32 per cent. The United States Steel Corporation, employing more than a quarter of a million people, shows as a result of accident-prevention work over a 14-year period a probable saving of 29,550 of its workers from serious injury or death. Other companies showing remarkable accident records include the Raritan Copper works, the Dupont Co., the Bethlehem Steel Co., and the Federal Rubber Co. It seems, therefore, that accidents can be reduced, with consequent large financial saving to employer and employee. The general superintendent of the Moctezuma Copper Co., a subsidiary of the Phelps Dodge Corporation, states that "Intensive safety work does not increase costs, but it is an aid to better efficiency and reduces compensation and insurance expenditures. With better contact between the management and employees on the common ground of safety, labor misunderstandings are reduced to a minimum. - - - The Phelps Dodge Corporation objective is no more 'lost-time' accidents."

How are accidents in the mining and other industries being lessened and how are some operations going from year to year without a lost time accident? By systematic, determined, continued effort from the top down. First the management must be "sold" on accident prevention and make this plain to all employees. Then the foreman and shift bosses must be "sold" on the idea that accidents can be prevented and that they are the main and responsible agents in accident prevention. As long as all accidents are blamed on carelessness of workers or on an act of God it is futile to expect accident reduction. One superintendent of a large mine, with operating experience in several Rocky Mountain States, states that 75 per cent of all mine accidents were in some degree the fault of the management; some authorities place management responsibility at more than 90 per cent.

In accident-prevention work safety education, mechanical safeguards, and a good code of safety rules are important; but such measures may give only slight or no reduction in accidents unless the mine officials, including the foremen, are really interested and actively working for mine safety. It should be possible to secure such interest in safety, when all mine officials realize that accidents, aside from a purely humanitarian aspect, very materially affect both production costs and efficiency.

Assuming that all mine officials are thus interested in accident reduction or elimination, how can they go about getting results? In small mines the superintendent or foreman can himself supervise all work and see that it is done as safely as the nature of the work permits. He can rectify faulty practice resulting from ignorance by proper instruction; he can rectify careless unsafe practices by instruction and discipline. A habitually careless man whether official or employee is far better off outside of the mine. And any rules or laws cannot be enforced unless there is some system of discipline or punishment behind them.

Digitized by Google

An inquiry of one mining company as to how much trouble they were having with getting their men to wear goggles in certain mining work brought this answer: "None. When a man receives an eye injury it is direct evidence of a violation of our rule and he is laid off; one or two men laid off have resulted in a cessation of eye injuries. And the men don't conceal their injuries by laying off, for if a man is absent for more than one day without the permission of the foreman he is also laid off." Some companies post and enforce the following rule: All officials or employees found guilty of violation of the safety rules or of dangerous practices or who fail to cooperate in the support of the company safety policy shall be penalized as follows: First offense - reprimanded or suspended; second offense - suspended or discharged; third offense - discharged.

Of perhaps equal importance with supervision and discipline are safe appliances, efficient tools, and safeguarded surroundings. Good mechanically induced ventilation in the deeper mines has greatly increased the efficiency of the miner and is an especially important safety factor in event of serious mine fire. Properly guarded moving machinery can prevent many an injury or death. Fireproofed structures at and near mine openings avoid the possibility of suffocation of every man in the mine in the event of fire. Proper bars and properly sharpened and conditioned tools have prevented many an accident. Safety hats and safety shoes lessen both slight and serious injuries. A manager of a large mining company states that in 1927 they had 156 head injuries, with a force of less than 700 men; in 1928, with the universal use of "hard-boiled" hats underground, there had been no head injuries.

Education and training of the men along safety lines are considered by many authorities to be of the first importance. In such education and training there should be included the formulation of a code of safety rules and a requirement that all employees understand these rules. One large company requires every new employee to pass an examination on his knowledge of such of the company rules as concern his work within two weeks after his employment. A new employee should be immediately instructed as to how to perform his particular job safely. Safety education of workers is a continuous process, and means of accomplishing it include lunch-hour talks with the men, posters and bulletin boards, publicity of accidents and other matters of interest on a large blackboard where men congregate, photographs of accidents, pictures of good and bad working practices, safety committees who make weekly inspections, first-aid training, first-aid contests, safety and recreational meetings of officials and employees, and slipping of safety messages into pay envelopes. One company with scattered employees requires the foreman to discuss individually with each one or at most two workmen every two weeks some safety lesson written up briefly for the foreman by the general manager's office. Other means of continuing safety interest include public announcements of reasons for laying off men, posted letters of praise or criticism, cigars or other recognition to crews going for a certain period of time without a lost-time accident, talks to men upon their return to work from an injury or layoff, safety contests, and rotation of employees on safety committees.

For the larger companies actively working safety committees may afford much assistance to the foremen. Suggestions secured from the workmen themselves are often of much value to the foremen.

Many are now stressing the importance of the accidents that have not yet caused

Digitized by Google

injury or the injury in the making. Over 300 such noninjury accidents are said to occur to each injury. A noninjury accident affords an almost providential chance to correct a dangerous condition or practice before a man is hurt; and a careful investigation of such accidents as well as of those involving man injury is urged.

Bonus and penalty systems for foremen have been used by some of the larger companies with good results in accident reduction.

A brief statement is here given regarding the accident prevention work of the U. S. Bureau of Mines. The director of the bureau, Scott Turner, has repeatedly stated that safety work is the major activity of the bureau. The Bureau of Mines safety work is entirely educational in its scope and depends upon the cooperation of mine operator and miner. The Bureau of Mines has no supervisory power. It expends annually over $700,000 on its studies of mine accidents, operation of mine safety cars and safety stations, studies of mining practices and conditions in relation to safety, and studies and investigations toward safer mining equipment.

The United States Bureau of Mines offers to the mine operator and miner through its engineers, surgeons, or chemists (1) examination of mines relative to safety conditions and practices; (2) safety instruction of miners and officials through the media of the personnel of safety cars and eleven safety stations located at advantageous points throughout the mining districts of the United States and Alaska; (3) assistance of its car and station personnel with protective equipment at mine fires and explosions involving or likely to involve loss of life; (4) investigations relative to the effect of gases and dusts upon the health of workers; (5) general mining-community sanitary survey work; (6) research work in the Pittsburgh laboratories on the effects of various toxic gases encountered in mining; (7) laboratory studies on gas masks, oxygen breathing apparatus, and other respiratory protective devices; (8) sampling and analysis of gases encountered in individual mines for the benefit of the particular operator concerned; (9) motion-picture films relating to safety for use in mining-community safety meetings; (10) laboratory and field studies on electrical safety; (11) studies of explosives and explosives practice relative to increased safety in the handling and use of explosives; (12) studies of mine mechanical equipment in respect to safety; (13) studies of mine-roof fall hazards and haulage hazards; (14) mine-ventilation investigations; (15) mine-explosion prevention studies; and (16) statistical studies of mine accidents.

The U. S. Bureau of Mines has issued numerous publications relating to practically all phases of mining and metallurgical safety, many of which are available without charge and others of which are available at a nominal charge through the Superintendent of Documents, Washington, D. C.

Digitized by Google